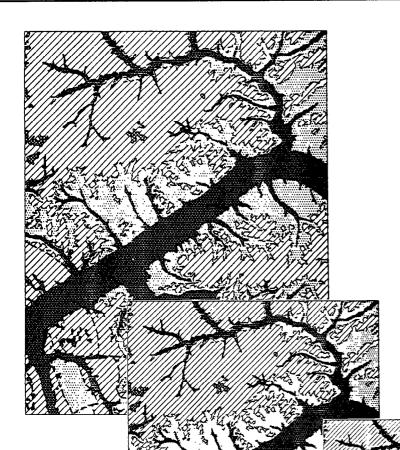
Open-File Report 94-359

Conversion of Geologic Quadrangle Maps to Geologic Coverages







Prepared by the U.S. Geological Survey

in cooperation with the
Tennessee Division of Environment and Conservation,
U.S. Army Corps of Engineers,
Tennessee Valley Authority, and the
U.S. Soil Conservation Service

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By JOSEPH F. CONNELL, WILLIAM R. BARRON, JR., and REAVIS L. MITCHELL, III

U.S. GEOLOGICAL SURVEY Open-File Report 94-359

Prepared in cooperation with the Tennessee Division of Environment and Conservation, U.S. Army Corps of Engineers, Tennessee Valley Authority, and the U.S. Soil Conservation Service



U.S. DEPARTMENT OF THE INTERIOR BRUCE BABBITT, Secretary

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Conversion of Geologic Quadrangle Maps to Geologic Coverages

by Joseph F. Connell, William R. Barron, Jr., and Reavis L. Mitchell, III

ABSTRACT

Three hundred sixty-eight geologic maps of $7^1/2$ -minute quadrangles in Tennessee were converted to geographic information system (GIS) coverages. The procedure used was documented and a list was made of the quadrangles included in the coverages. Maps were converted to GIS coverages by making film copies of scribecoats of the maps. The film copies were scanned, vectorized, and written into a generate format. Coverage polygons were tagged with symbols to identify geologic units, and coverage lines were tagged with line types to designate stratigraphic contacts.

INTRODUCTION

Geologic coverages available to geographic information system (GIS) users typically have been made from 1:250,000-scale base maps. Maps at this scale provide insufficient resolution of detail needed for hydrogeologic and other studies of areas that are less than regional in scope. Studies of these smaller areas often require the more detailed information available on maps at a scale of 1:24,000. At present, this need is met by using geologic maps of quadrangles published at a scale of 1:24,000 by the U.S. Geological Survey (USGS) and the Tennessee Division of Geology. However, the use of paper copies of geologic maps to produce derivative maps is inefficient; in contrast, this task is handled quickly and efficiently with GIS technology. Therefore, the USGS, in cooperation with the Tennessee Department of Environment and Conservation, the U.S. Army Corps of Engineers, the Tennessee Valley Authority, and the U.S. Soil Conservation Service, initiated a project during spring 1990, to convert information on the 7½-minute geologic quadragle maps to digital files that can be accessed with different types of GIS software.

Tennessee is divided into 811 quadrangles at a scale of 1:24,000. Of the 412 quadrangles for which geologic maps have been published by the USGS or the Tennessee Division of Geology (1992), maps for 368 quadrangles were converted to GIS coverages using ARC/INFO (Environmental Systems Research Institute, 1992) programs. This report describes the procedure used to convert the maps and lists the quadrangle names.

Many persons were involved in the project. The authors especially express their appreciation to Elaine Foust of the Tennessee Division of Geology for assistance in acquiring the scribecoats and resolving questions concerning interpretation of the maps. The authors also extend their thanks to the 10 cooperative education students and USGS employees whose efforts contributed immeasurably to the completion of the project.

DATA CONVERSION

Scribecoats for 342 of the 371 geologic maps prepared by the Tennessee Division of Geology and printed by the Tennessee Valley Authority (TVA) were retrieved from TVA archives. Scribecoats also were obtained for 26 of the 36 geologic maps prepared by the USGS. Maps for some of the quadrangles on the borders of the State were combined with adjacent quadrangles (Tennessee Division of Geology, 1992). After filming the scribecoats, the film copies were converted to coverages.

Procedure

Film copies of the maps were scanned using a Contex FSS3012 full-scale scanner and converted to Hatachi raster format with CADImage software. The raster file was vectorized with CADCore software installed on a 386 personal computer. After vectorization, the drawing file was converted to an ARC/INFO generate-format file (Environmental Systems Research Institute, 1992) and transferred to a Data General (DG) workstation for conversion to an ARC/INFO coverage.

ARC/INFO loaded on DG Avion 300 workstations was used for conversion to digital data. The generate-format file was converted to an ARC/INFO GIS coverage and moved to ARCEDIT to remove dangling nodes so polygons could be completed. Tick marks were added and positioned so that their locations corresponded to the corners of the 7¹/₂-minute quadrangle maps. Tick marks from a quadrangle coverage of Tennessee in State Plane (SP) projection were used to transform the geologic coverage into SP projection. The projection parameters were (1) zone, 5301; (2) units, feet; and (3) datum, nad27. If the projection root mean square error was greater than 20 feet, the transformed coverage was reviewed for error. Larger errors generally were associated only with the older maps. For a final test of shape and agreement in location, the quadrangle boundary was retrieved from the corresponding SP quadrangle coverage and overlain with the transformed geologic coverage. If the boundaries matched, the geologic coverage was ready for cleanup and tagging. The transformed geologic coverage boundary was replaced with the boundary from the corresponding 7¹/₂-minute quadrangle coverage to ensure sliver polygons would not occur between the geologic coverages when appended along their common boundaries. Dangling arcs resulting from the boundary replacement were extended into the new boundary and dangling arcs outside the new boundary were removed. Pseudo nodes were removed from the arcs in order for new pseudo nodes to be added at locations along a line where a geologic contact changed. As a final step in this phase, label points were added to allow for tagging of the polygons.

Both the lines and the polygons were tagged for each geologic coverage. The lines were tagged as contacts, faults, or boundaries. The contacts were tagged as OUTCROP or APPROX to indicate the observed location or approximate location of a stratigraphic contact, respectively. The faults were tagged as FAULT or A-FAULT to indicate the observed location or approximate location of the fault, respectively. The boundaries were tagged as BOUNDARY or ST-LINE to indicate the boundary of the quadrangle or a state line. Next, the polygons were tagged with the same formation symbol as on the geologic map. For a final check, the completed geologic coverage was plotted and compared with the original published geologic map.

Problems Encountered

Some of the problems that arose during the conversion were:

- Only those geologic maps with a scannable scribecoat could be converted.
- Lake outlines were not delineated on the scribecoat of some maps; therefore, the geologic units associated with the lake outline were tagged as alluvium.
- In a few instances, the geologist subdivided a formation but did not extend the subdivision to a contact boundary. In order to complete the polygons for tagging, judgments were made concerning the placement of lines to manually close the polygons.
- Fault locations were grouped into one of two categories, either observed or approximate. Faults were not further categorized by type of fault.
- In a few instances, stratigraphic contacts on the coverage did not exactly overlay the corresponding contacts on the published map. This may be the result of different types of projections used. Additionally, geologic maps were constructed over a period of 30 years by different geologists; consequently, stratigraphic delineation may be more detailed on some geologic quadrangles than on adjacent quadrangles, and geologic interpretation may differ between adjoining quadrangles.

DATA OUTPUT

GIS coverages were completed for the 368 quadrangles listed in table 1, which is sorted by row and column, and in table 2, which is sorted by quadrangle name. Locations of the quadrangles are shown in figure 1, and an example plot of the geologic coverage for the Needmore quadrangle is shown in figure 2. The digital data are available in two output formats: (1) ARCEXPORT format (Environmental Systems Research Institute, Inc., 1992), which is machine independent, but requires ARC/INFO software, and (2) Standard Digital Line Graph format (U.S. Geological Survey, 1989), which is machine and software independent.

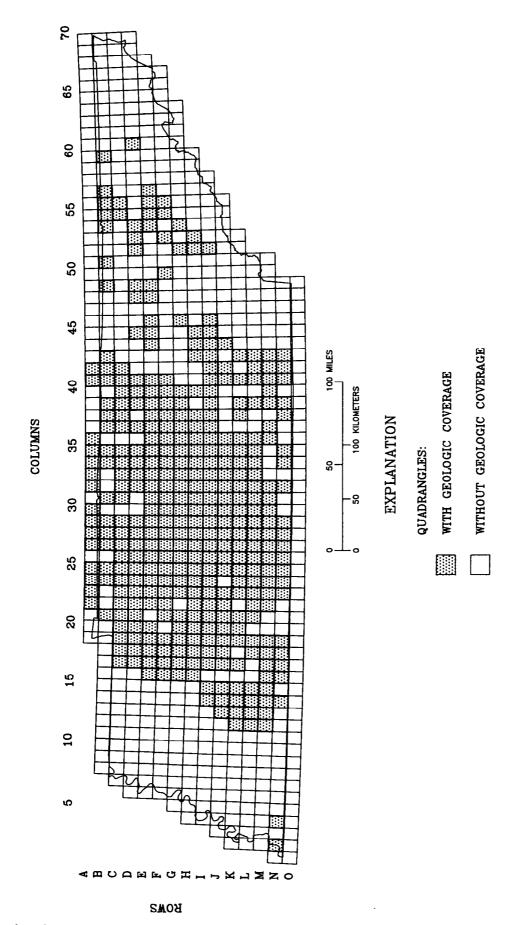
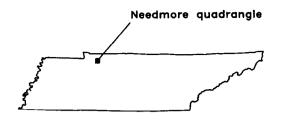


Figure 1. Location of quadrangles with geologic coverage for Tennessee.



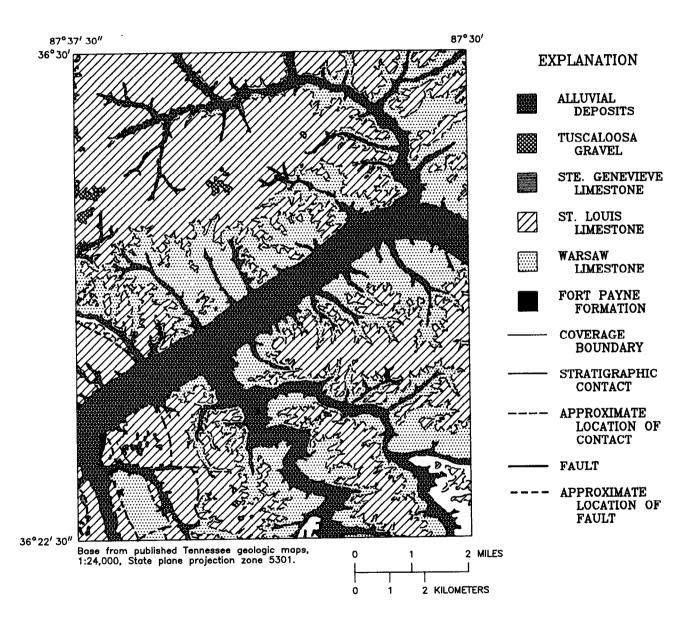


Figure 2. Example of a geologic coverage, Needmore quadrangle, Tennessee.

Table 1. Completed geologic coverages for Tennessee, sorted by row and column

[Row and column refer to figure 1. ID is quadrangle identification number assigned by Tennessee Valley Authority]

Row	Column	Quadrangle name	ID
Α,	22	ROARING SPRING	300 NW
Α	23	HERNDON	300 NE
Α	24	OAK GROVE	301 NW
Α	25	TRENTON	301 NE
Α	27	ALLENSVILLE	303 NE
Α	28	DOT	306 NW
A	29	ADAIRVILLE	306 NE
A	30	PRICES MILL	309 NW
Α	32	HICKORY FLAT	312 NW
Α	33	ADOLPHUS	312 NE
Α	34	PETROLEUM	316 NW
Α	35	HOLLAND	316 NE
Α	36	FOUNTAIN RUN	320 NW
Α	41	FROGUE	329 NE
Α	42	ALBANY	333 NW
В	21	BUMPUS MILLS	28 SE
В	24	NEW PROVIDENCE	301 SW
В	25	CLARKSVILLE	301 SE
В	27	ADAMS	303 SE
В	28	SPRINGFIELD NORTH	306 SW
В	29	YOUNGVILLE	306 SE
В	31	PORTLAND	309 SE
В	34	WESTMORELAND	316 SW
В	35	LAFAYETTE	316 SE
В	37	RED BOILING SPRINGS	320 SE
В	38	UNION HILL	324 SW
В.	39	CELINA	324 SE
В	41	DALE HOLLOW RESERVOIR	329 SE
В	42	BYRDSTOWN	333 SW
В	43	MOODYVILLE	333 SE
В	49	KETCHEN	337 SE
В	51	JELLICO EAST	338 SE
В	54	MIDDLESBORO SOUTH	153 SW
В	55	WHEELER	153 SW
В	56	COLEMAN GAP	161 SW
В	57	BACK VALLEY	161 SE
В	60	LOONEYS GAP	101 SE 179 SW
C	17	PURYEAR	8 NE
C	18	BUCHANAN	19 NW
C	19 20	PARIS LANDING	19 NE
C	20	STANDING ROCK	29 NW
C	21	DOVER	29 NE
C	22	CUMBERLAND CITY	38 NW
C	23	NEEDMORE	38 NE
C	24	PALMYRA	302 NW
C	25	EXCELL	302 NE
С	26	HENRIETTA	304 NV

Table 1. Completed geologic coverages for Tennessee, sorted by row and column--Continued

Row	Column	Quadrangle name	ID
С	27	PLEASANT VIEW	304 NE
C	28	SPRINGFIELD SOUTH	307 NV
С	29	GREENBRIER	307 NE
C	31	COTTONTOWN	310 NE
C	32	GALLATIN	313 NV
С	33	BETHPAGE	313 NE
С	34	HARTSVILLE	317 NV
С	35	HILLSDALE	317 NE
C	37	WILLETTE	321 NE
С	38	WHITLEYVILLE	325 NV
C	39	BURRISTOWN	325 NE
С	40	HILHAM	330 NV
С	41	LIVINGSTON	330 NE
С	42	ALPINE	334 NV
С	55	TAZEWELL	154 NE
C	56	HOWARD QUARTER	162 NV
D	17	PARIS	8 SE
D	18	WEST SANDY DIKE	19 SW
D	19	POPLAR CREEK	19 SE
D	20	MCKINNON	29 SW
D	21	STEWART	29 SE
D	22	ERIN	38 SV
D	23	ELLIS MILLS	38 SE
D	24	SLAYDEN	302 SV
D	25	CUMBERLAND FURNANCE	302 SE
D	26	CHEATHAM DAM	304 SV
D	27	ASHLAND CITY	304 SE
D	28	FOREST GROVE	307 SV
D	29	WHITES CREEK	307 SE
D	32	LAGUARDO	313 SV
D	33	HUNTERS POINT	313 SE
D	34	BELLWOOD	317 SV
D	35	DIXON SPRINGS	317 SE
D	37	GRANVILLE	321 SE
D	39	DODSON BRANCH	325 SE
D	40	WINDLE	330 SV
D	41	OKALONA	330 SE
D	45	BURRVILLE	115 SE
D	48	NORMA	128 SV
D	49	BLOCK	128 SE
D	52	WHITE HOLLOW	145 SV
D	53	MAYNARDVILLE	145 SE
D	54	POWDER SPRINGS	154 SV
D	61	BAILEYTON	180 SE
E	16	HENRY	9 N
E	17	MANSFIELD	9 NI
E	18	MANLEYVILLE	20 N
E	19	BIG SANDY	20 NI
E	20	HARMON CREEK	30 N
Е	22	WOOLWORTH	39 N

Table 1. Completed geologic coverages for Tennessee, sorted by row and column--Continued

Row	Column	Quadrangle name	ID
E	23	RUSKIN	39 NE
E	24	VANLEER	48 NW
E	25	CHARLOTTE	48 NE
E	26	HARPETH VALLEY	305 NW
Ε	27	LILLAMAY	305 NE
E	28	SCOTTSBORO	308 NW
E	29	NASHVILLE WEST	308 NE
E	30	NASHVILLE EAST	311 NW
E	31	HERMITAGE	311 NE
E	32	MARTHA	314 NV
Ē	33	LEBANON	314 NE
E	34	SHOP SPRINGS	318 NV
E	35	NEW MIDDLETON	318 NE
E	36	GORDONSVILLE	322 NV
E		BUFFALO VALLEY	
_	37		322 NE
E	38	BAXTER	326 NV
E	39	COOKEVILLE WEST	326 NE
E	40	COOKEVILLE EAST	331 NV
E	41	MONTEREY	331 NE
E	44	JONES KNOB	116 NV
E	45	TWIN BRIDGES	116 NE
E	46	PILOT MOUNTAIN	122 NV
E	48	FORK MOUNTAIN	129 NV
E	49	DUNCAN FLATS	129 NE
E	54	LUTTRELL	155 NV
E	55	JOPPA	155 NE
E	56	TALBOTT	163 NV
E	57	MORRISTOWN	163 NE
F	16	HUNTINGDON	9 SW
F	17	VALE	9 SE
F	18	BRUCETON	20 SW
F	19	CAMDEN	20 SE
F	21	WAVERLY	30 SE
F	22	MCEWEN	39 SW
F	23	TENNESSEE CITY	39 SE
		-	48 SW
F	24	DICKSON	
F	25	BURNS	48 SE
F	26	WHITE BLUFF	305 SW
F	27	KINGSTON SPRINGS	305 SE
F	28	BELLEVUE	308 SW
F	29	OAK HILL	308 SE
F	30	ANTIOCH	311 SW
F	31	LAVERGNE	311 SE
F	32	GLADEVILLE	314 SW
F	33	VINE	314 SE
F	34	WATERTOWN	318 SW
F	35	ALEXANDRIA	318 SE
F	36	LIBERTY	322 SW
F	37	CENTER HILL DAM	322 SE
F	38	SILVER POINT	326 SW

Table 1. Completed geologic coverages for Tennessee, sorted by row and column--Continued

Row	Column	Quadrangle name	D
F	39	BURGESS FALLS	326 SE
F	40	DRY VALLEY	331 SW
F	41	MONTEREY LAKE	331 SE
F	50	CLINTON	137 SW
F	53	JOHN SEVIER	146 SE
F	55	NEW MARKET,TN	155 SE
F	56	JEFFERSON CITY	163 SW
G	16	PALMER SHELTER	10 NV
G	17	BUENA VISTA	10 NE
G	18	SEVENTEEN CREEK	21 NV
G	19	ROCKPORT	21 NE
G	20	HUSTBURG	31 NV
G	21	HURRICANE MILLS	31 NE
G	23	SPOT	40 NE
G	24	TEXAS HOLLOW	49 NV
G	25	LYLES	49 NE
G	26	CRAIGFIELD	56 NV
G	27	FAIRVIEW	56 NE
G	28	LEIPERS FORK	63 NV
G	29	FRANKLIN	63 NE
G	30	NOLENSVILLE	70 NV
G	31	SMYRNA	70 NE
G	32	WALTERHILL	315 NV
G	33	LASCASSAS	315 NE
G	34	MILTON	319 NV
G	35	AUBURNTOWN	319 NE
G	36	GASSAWAY	323 NV
G	37	SMITHVILLE	323 NE
G	38	SLIGO BRIDGE	327 NV
G	39	CASSVILLE	327 NE
G	40	SPARTA	332 NV
G	46	CARDIFF	123 NV
G	52	KNOXVILLE	147 NV
G	54	BOYDS CREEK	156 NV
H	16	CLARKSBURG	10 SW
H	17	YUMA	10 SE
Н	18	HOLLADAY	21 SW
H	19	SUGAR TREE	21 SE
H	20	DANIELS LANDING	31 SW
H	21	LOBELVILLE	31 SE
H	22	COBLE	40 SW
H	23	WHITFIELD	40 SE
H	24	CENTERVILLE	49 SW
H	25	LITTLELOT	49 SE
H	26	PRIMM SPRINGS	56 SW
H	27	THETA	56 SE
H	28	SPRING HILL	63 SW
H	29	BETHESDA	63 SE
H	30	COLLEGE GROVE	70 SW
H	31	ROCKVALE	70 SE
H	32	MURFREESBORO	315 SW

Table 1. Completed geologic coverages for Tennessee, sorted by row and column--Continued

Row	Column	Quadrangle name	ID
Н	33	DILLTON	315 SE
H	34	READYVILLE	319 SW
H	35	WOODBURY	319 SE
H	36	SHORT MOUNTIAN	323 SW
Η,	37	DIBRELL	323 SE
H	38	CAMPAIGN	327 SW
H	40	BALD KNOB	332 SW
H	43	VANDEVER `	109 SE
H	44	GRASSY COVE	117 SW
H	45	RODDY	117 SE
H	52	MARYVILLE	147 SW
H	53	WILDWOOD	147 SE
I	14	CLAYBROOK	446 NW
I	15	JUNO	446 NE
I	17	CHESTERFIELD	11 NE
I	18	PARSONS	22 NW
I	19	JEANNETTE	22 NE
I	20	PINE VIEW	32 NW
I	21	CHESTNUT GROVE	32 NE
I	22	PLEASANTVILLE	41 NW
I	23	BEAVERDAM SPRINGS	41 NE
I	24	SUNRISE	50 NW
I	25	GREENFIELD BEND	50 NE
I	26	WILLIAMSPORT	57 NW
I	27	GODWIN	57 NE
I	28	CARTERS CREEK	64 NW
I	29	RALLY HILL	64 NE
I	30	CHAPEL HILL	71 NW
I	31	ROVER	71 NE
I	32	FOSTERVILLE	78 NW
I	33	WEBBS JUNGLE	78 NE
I	34	BEECH GROVE	85 NW
I	35	HOLLOW SPRINGS	85 NE
I	36	CENTERTOWN	92 NW
I	37	MCMINNVILLE	92 NE
I	38	CARDWELL MOUNTAIN	328 NW
I	39	WELCHLAND	328 NE
I	40	SPENCER	103 NW
I	41	SAMPSON	103 NE
I	42	BILLINGSLEY	110 NW
I	43	MELVINE	110 NE
I	44	PENNINE	118 NW
I	45	SPRING CITY	118 NE
I	46	TEN MILE	124 NW
I	52	BLOCKHOUSE	148 NW
J	13	JACKSON SOUTH	438 SE
J	14	BEECH BLUFF	446 SW
J	15	LURAY	446 SE
J	17	REAGAN	11 SE
J	18	SCOTTS HILL	22 SW
J	19	PERRYVILLE	22 SE

Table 1. Completed geologic coverages for Tennessee, sorted by row and column--Continued

Row	Column	Quadrangle name	ID
J	20	POPE	32 SW
J	21	LINDEN	32 SE
J	22	GRAVE SPRINGS	41 SW
J	23	KIMMINS	41 SE
J	25	MOUNT JOY	50 SE
J	26	MOUNT PLEASANT	57 SW
J	27	COLUMBIA	57 SE
J	28	GLENDALE	64 SW
J	29	VERONA	64 SE
j	30	FARMINGTON	71 SW
J	31	UNIONVILLE	71 SE
J	32	DEASON	78 SW
J	33	WARTRACE	78 SE
J	34	NOAH	85 SW
J	35	FREDONIA	85 SE
j	36	MORRISON	92 SW
J	41	BROCKDELL	103 SE
j	41 42		103 SE 110 SW
		PIKEVILLE	110 SW 118 SW
J	44	EVENSVILLE	
K	12	TEAGUE	439 NW
K	13	MEDON	439 NE
K	14	HENDERSON	12 AN
K	15	JACKS CREEK	12 AN
K	17	SARDIS	12 NE
K	19	BATH SPRINGS	23 NE
K	20	CLIFTON	33 NW
K	21	LEATHERWOOD	33 NE
K	23	RIVERSIDE	42 NE
K	24	HENRYVILLE	51 NW
K	25	SUMMERTOWN	51 NE
K	26	SANDY HOOK	58 NW
K	27	LYNNVILLE	58 NE
K	28	CAMPBELLS STATION	65 NW
K	29	LEWISBURG	65 NE
K	30	BELFAST	72 NW
K	31	BEDFORD	72 NE
K	32	SHELBYVILLE	79 NW
K	33	NORMANDY	79 NE
ĸ	34	NORMANDY LAKE	86 NW
K	35	MANCHESTER	86 NE
K	36	HILLSBORO	93 NW
K	38	ALTAMONT	99 NW
K	39	COLLINS	99 NE
K K	39 41	MOUNT AIRY	104 NE
			104 NE
K	43	GRAYSVILLE BOLIVAR FAST	
L	12	BOLIVAR EAST	439 SW
L	13	SILERTON	439 SE
L	14	MASSEYVILLE	12 AS
L	15	MT. PETER	12 ASI
L	18	HOOKERS BEND	23 SW
L	19	OLIVEHILL	23 SE

Table 1. Completed geologic coverages for Tennessee, sorted by row and column--Continued

Row	Column	Quadrangle name	ID
L	21	WAYNESBORO	33 SE
L	22	NEGRO HOLLOW	42 SW
L	23	OVILLA	42 SE
L	24	DEERFIELD	51 SW
L	25	ETHRIDGE	51 SE
L	26	CAMPBELLSVILLE	58 SW
L	27	MILKY WAY	58 SE
L	28	BRICK CHURCH	65 SW
L	29	CORNERSVILLE	65 SE
L	30	PETERSBURG	72 SW
L	31	BELLEVILLE	72 SE
L	32	LYNCHBURG WEST	79 SW
L	33	LYNCHBURG EAST	79 SE
L	34	TULLAHOMA	86 SW
L	35	CAPITOL HILL	86 SE
L	36	ALTO	93 SW
L	39	PALMER	99 SE
L	41	HENSON GAP	104 SE
L	42	SODDY	111 SW
L	43	GRASSHOPPER CREEK	111 SE
M	12	HEBRON	440 NW
M	13	HORNSBY	440 NE
M	14	ROSE CREEK	4 NW
M	15	PURDY	4 NE
M	16	STANTONVILLE	13 NW
M	17	PITTSBURG LANDING	13 NE
M	18	SAVANNAH	24 NW
M	19	WOLF PIT RIDGE	24 NE
M	22	COLLINWOOD	43 NW
M	23	WESTPOINT	43 NE
M	24	LONG BRANCH	52 NW
M	25	LAWRENCEBURG	52 NE
M	26	BODEHAM	59 NW
M	27	PULASKI	59 NE
M	28	TARPLEY	66 NW
M	29	FRANKEWING	66 NE
M	30	BOONSHILL	73 NW
M	31	FAYETTEVILLE	73 NE
M	32	MULBERRY	80 NW
M	36	SEWANEE	94 NW
M	37	MONTEAGLE	94 NE
M	39	WHITWELL	100 NE
M	40	KETNER GAP	105 NW
M	41	FAIRMOUNT	105 NE
M	42	DAISY	112 NW
M	43	SNOW HILL	112 NE
N	2	FLETCHER LAKE	404 SW
N	4	SOUTHEAST MEMPHIS	409 SW
N	14	CHEWALLA	4 SW
N	16	MICHIE	13 SW
N	17	COUNCE	13 SE

Table 1. Completed geologic coverages for Tennessee, sorted by row and column--Continued

Row	Column	Quadrangle name	ID
N	18	PICKWICK	24 SW
N	19	LOWRYVILLE	24 SE
N	23	ST. JOSEPH	43 SE
N	24	LORETTO	52 SW
N	25	BONNERTOWN	52 SE
N	26	APPLETON	59 SW
N	27	ASPEN HILL	59 SE
N	28	ELKTON	66 SW
N	29	DELLROSE	66 SE
N	32	FLINTVILLE	80 SW
N	34	BEANS CREEK	87 SW
N	35	PITCHER RIDGE	87 SE
N	38	SOUTH PITTSBURG	100 SW
N	39	SEQUATCHIE	100 SE
N	41	CHATTANOOGA	105 SE
N	42	EAST CHATTANOOGA	112 SW
N	43	OOLTEWAH	112 SE

Table 2. Completed geologic coverages in Tennessee, sorted by quadrangle name

[Row and column refer to figure 1. ID is quadrangle identification number assigned by Tennessee Valley Authority]

Row	Column	Quadrangle Name	I	<u> </u>
A	29	ADAIRVILLE	306	NE
В	27	ADAMS	303	SE
Α	33	ADOLPHUS	312	NE
Α	42	ALBANY	333	NW
F	35	ALEXANDRIA	318	SE
Α	27	ALLENSVILLE	303	NE
С	42	ALPINE	334	NW
K	38	ALTAMONT	99	NW
L	36	ALTO	93	SW
F	30	ANTIOCH	311	SW
N	26	APPLETON	59	SW
D	27	ASHLAND CITY	304	SE
N	27	ASPEN HILL	59	SE
G	35	AUBURNTOWN	319	NE
В	57	BACK VALLEY	161	SE
D	61	BAILEYTON	180	SE
H	40	BALD KNOB	332	SW
K	19	BATH SPRINGS	23	NE
E	38	BAXTER	326	NW
N	34	BEANS CREEK	87	SW
I	23	BEAVERDAM SPRINGS	41	NE
K	31	BEDFORD	72	NE
J	14	BEECH BLUFF	446	SW
I	34	BEECH GROVE	85	NW
K	30	BELFAST	72	NW
L	31	BELLEVILLE	72	SE
F	28	BELLEVUE	308	sw
D	34	BELLWOOD	317	sw
Н	29	BETHESDA	63	SE
С	33	BETHPAGE	313	NE
E	19	BIG SANDY	20	NE
I	42	BILLINGSLEY	110	NW
D	49	BLOCK	128	SE
I	52	BLOCKHOUSE	148	NW
M	26	BODEHAM	59	NW
L	12	BOLIVAR EAST	439	SW
N	25	BONNERTOWN	52	SE
M	30	BOONSHILL	73	NW
G	54	BOYDS CREEK	156	NW
L	28	BRICK CHURCH	65	SW
J	41	BROCKDELL	103	SE
F	18	BRUCETON	20	sw
С	18	BUCHANAN	19	NW
G	17	BUENA VISTA	10	NE
E	37	BUFFALO VALLEY	322	NE
В	21	BUMPUS MILLS	28	SE
F	39	BURGESS FALLS	326	SE

Table 2. Completed geologic coverages in Tennessee, sorted by quadrangle name--Continued

Row	Column	Column Quadrangle Name		<u> </u>
F	25	BURNS	48	SE
c	39	BURRISTOWN	325	NE
D	45	BURRVILLE	115	SE
B.	42	BYRDSTOWN	333	sw
F	19	CAMDEN	20	SE
H	38	CAMPAIGN	327	sw
K	28	CAMPBELLS STATION	65	NW
L	26	CAMPBELLSVILLE	58	sw
L	35	CAPITOL HILL	86	SE
G	46	CARDIFF	123	NW
I	38	CARDWELL MOUNTAIN	328	NW
I	28	CARTERS CREEK	64	NW
G	39	CASSVILLE	327	NE
В	39	CELINA	324	SE
F	37	CENTER HILL DAM	322	SE
I	36	CENTERTOWN	92	NW
H	24	CENTERVILLE	49	SW
I	30	CHAPEL HILL	71	NW
E	25	CHARLOTTE	48	NE
N	41	CHATTANOOGA	105	SE
D	26	CHEATHAM DAM	304	sw
I	17	CHESTERFIELD	11	NE
I	21	CHESTNUT GROVE	32	NE
N	14	CHEWALLA	4	SW
H	16	CLARKSBURG	10	SW
В	25	CLARKSVILLE	301	SE
I	14	CLAYBROOK	446	NW
K	20	CLIFTON	33	NW
F	50	CLINTON	137	sw
Н	22	COBLE	40	SW
В	56	COLEMAN GAP	161	SW
Н	30	COLLEGE GROVE	70	SW
K	39	COLLINS	99	NE
M	22	COLLINWOOD	43	NW
J	27	COLUMBIA	57	SE
E	40	COOKEVILLE EAST	331	NW
E	39	COOKEVILLE WEST	326	NE
L	29	CORNERSVILLE	65	SE
С	31	COTTONTOWN	310	NE
N	17	COUNCE	13	SE
G	26	CRAIGFIELD	56	NW
C	22	CUMBERLAND CITY	38	NW
D	25	CUMBERLAND FURNANCE	302	SE
M	42	DAISY	112	NW
В	41	DALE HOLLOW RESERVOIR	329	SE
H	20	DANIELS LANDING	31	SW
J	32	DEASON	78	SW
L	24	DEERFIELD	51	SW
N	29	DELLROSE	66	SE
H	37	DIBRELL	323	SE

Table 2. Completed geologic coverages in Tennessee, sorted by quadrangle name--Continued

Row	Column	Quadrangle Name	ID	
			40	C337
F H	24 33	DICKSON DILLTON	48 315	SW SE
	35 35	DIXON SPRINGS	313	SE
D D	33 39	DODSON BRANCH	325	SE
_		DODSON BRAINCH	306	NW
A C	28 21	DOVER	29	NE
F	40	DRY VALLEY	331	SW
F E	40 49	DUNCAN FLATS	129	NE
E N	42	EAST CHATTANOOGA	112	SW
N N	28	ELKTON	66	SW
D	23	ELLIS MILLS	38	SE
	23 22	ERIN	38	SW
D L	22 25	ETHRIDGE	51	SE
J	23 44	EVENSVILLE	118	SW
	* *	EXCELL	302	NE
С	25		105	NE
M	41	FAIRMOUNT	56	NE
G	27	FARVIEW		SW
J	30	FARMINGTON	71	
M	31	FAYETTEVILLE	73	NE
N	2	FLETCHER LAKE	404	SW SW
N	32	FLINTVILLE	80	
D	28	FOREST GROVE	307	SW
E	48	FORK MOUNTAIN	129	NW
I	32	FOSTERVILLE	78	NW
A	36	FOUNTAIN RUN	320	NW
M	29	FRANKEWING	66	NE
G	29	FRANKLIN	63	NE
J	35	FREDONIA	85	SE
A	41	FROGUE	329	NE
C	32	GALLATIN	313	NW
G	36	GASSAWAY	323	NW
F	32	GLADEVILLE	314	SW
J	28	GLENDALE	64	sw
I	27	GODWIN	57	NE
E	36	GORDONSVILLE	322	NW
D	37	GRANVILLE	321	SE
L	43	GRASSHOPPER CREEK	111	SE
H	44	GRASSY COVE	117	SW
J	22	GRAVE SPRINGS	41	SW
K	43	GRAYSVILLE	111	NE
С	29	GREENBRIER	307	NE
I	25	GREENFIELD BEND	50	NE
E	20	HARMON CREEK	30	NW
E	26	HARPETH VALLEY	305	NW
С	34	HARTSVILLE	317	NW
M	12	HEBRON	440	NW
K	14	HENDERSON	12	ANW
С	26	HENRIETTA	304	NW
E	16	HENRY	9	NW
K	24	HENRYVILLE	51	NW

Table 2. Completed geologic coverages in Tennessee, sorted by quadrangle name--Continued

Row	Column	Quadrangle Name	ID	
L	41	HENSON GAP	104	SE
E	31	HERMITAGE	311	NE
Α	23	HERNDON	300	NE
Α	32	HICKORY FLAT	312	NW
C	40	HILHAM	330	NW
K	36	HILLSBORO	93	NW
С	35	HILLSDALE	317	NE
Н	18	HOLLADAY	21	SW
A	35	HOLLAND	316	NE
I	35	HOLLOW SPRINGS	85	NE
L	18	HOOKERS BEND	23	sw
M	13	HORNSBY	440	NE
C	56	HOWARD QUARTER	162	NW
D	33	HUNTERS POINT	313	SE
F	16	HUNTINGDON	9	SW
G	21	HURRICANE MILLS	31	NE
G	20	HUSTBURG	31	NW
K	15	JACKS CREEK	12	AN
J	13	JACKSON SOUTH	438	SE
I	19	JEANNETTE	22	NE
F	56	JEFFERSON CITY	163	SW
В	51 52	JELLICO EAST	338	SE
F	53	JOHN SEVIER	146	SE
E	44 55	JONES KNOB	116	NW
E I	55	JOPPA	155	NE
	15	JUNO	446	NE
B M	49 40	KETCHEN CAP	337	SE
J	23	KETNER GAP KIMMINS	105 41	NW SE
F	23 27	KINGSTON SPRINGS	305	SE
G G	52	KNOXVILLE	303 147	SE NW
В	35	LAFAYETTE	316	SE
D	33 32	LAGUARDO	313	SW
G	33	LASCASSAS	315	NE
F	33 31	LAVERGNE	313	SE
M	25	LAWRENCEBURG	52	NE
K	21	LEATHERWOOD	32	NE
E	33	LEBANON	314	NE
G	28	LEIPERS FORK	63	NW
K	29	LEWISBURG	65	NE
F	36	LIBERTY	322	SW
E	27	LILLAMAY	305	NE
J	21	LINDEN	32	SE
H	25	LITTLELOT	49	SE
C	41	LIVINGSTON	330	NE
H	21	LOBELVILLE	330	SE
M	24	LONG BRANCH	52	NW
В	60	LOONEYS GAP	179	SW
N	24	LORETTO	52	SW
• •	<u></u>		22	5 11

Table 2. Completed geologic coverages in Tennessee, sorted by quadrangle name--Continued

Row	Column	Quadrangle Name	ID	
J	15	LURAY	446	SE
E	54	LUTTRELL	155	NW
G	25	LYLES	49	NE
L	33	LYNCHBURG EAST	79	SE
L .	32	LYNCHBURG WEST	79	SW
ĸ	27	LYNNVILLE	58	NE
ĸ	35	MANCHESTER	86	NE
E	18	MANLEYVILLE	20	NW
E	17	MANSFIELD	9	NE
Ē	32	MARTHA	314	NW
н	52	MARYVILLE	147	sw
L	14	MASSEYVILLE	12	ASW
D	53	MAYNARDVILLE	145	SE
F	22	MCEWEN	39	SW
D	20	MCKINNON	29	sw
Ī	37	MCMINNVILLE	92	NE
ĸ	13	MEDON	439	NE
Ī	43	MELVINE	110	NE
N	16	MICHIE	13	sw
В	54	MIDDLESBORO SOUTH	153	SW
L	27	MILKY WAY	58	SE
Ğ	34	MILTON	319	NW
M	37	MONTEAGLE	94	NE
Е	41	MONTEREY	331	NE
F	41	MONTEREY LAKE	331	SE
В	43	MOODYVILLE	333	SE
J	36	MORRISON	92	SW
E	57	MORRISTOWN	163	NE
K	41	MOUNT AIRY	104	NE
J	25	MOUNT JOY	50	SE
L	15	MT. PETER	12	ASE
J	26	MOUNT PLEASANT	57	sw
M	32	MULBERRY	80	NW
Н	32	MURFREESBORO	315	sw
E	30	NASHVILLE EAST	311	NW
E	29	NASHVILLE WEST	308	NE
С	23	NEEDMORE	38	NE
L	22	NEGRO HOLLOW	42	sw
F	55	NEW MARKET,TN	155	SE
E	35	NEW MIDDLETON	318	NE
В	24	NEW PROVIDENCE	301	sw
J	34	NOAH	85	sw
G	30	NOLENSVILLE	70	NW
D	48	NORMA	128	sw
K	33	NORMANDY	79	NE
K	34	NORMANDY LAKE	86	NW
Α	24	OAK GROVE	301	NW
F	29	OAK HILL	308	SE
D	41	OKALONA	330	SE
L	19	OLIVEHILL	23	SE

Table 2. Completed geologic coverages in Tennessee, sorted by quadrangle name--Continued

Row	Column	Quadrangle Name	ID .	
N	43	OOLTEWAH	112 SE	
Ĺ	23	OVILLA	42 SE	
L	39	PALMER	99 SE	
G	16	PALMER SHELTER	10 NW	
С	24	PALMYRA	302 NW	
D	17	PARIS	8 SE	
С	19	PARIS LANDING	19 NE	
I	18	PARSONS	22 NW	
I	44	PENNINE	118 NW	
J	19	PERRYVILLE	22 SE	
L	30	PETERSBURG	72 SW	
Α	34	PETROLEUM	316 NW	
N	18	PICKWICK	24 SW	
J	42	PIKEVILLE	110 SW	
E	46	PILOT MOUNTAIN	122 NW	
I	20	PINE VIEW	32 NW	
N	35	PITCHER RIDGE	87 SE	
M	17	PITTSBURG LANDING	13 NE	
С	27	PLEASANT VIEW	304 NE	
I	22	PLEASANTVILLE	41 NW	
J	20	POPE	32 SW	
D	19	POPLAR CREEK	19 SE	
В	31	PORTLAND	309 SE	
D	54	POWDER SPRINGS	154 SW	
A	30	PRICES MILL	309 NW	
Н	26	PRIMM SPRINGS	56 SW	
M	27	PULASKI	59 NE	
M	15	PURDY	4 NE	
С	17	PURYEAR	8 NE	
I	29	RALLY HILL	64 NE	
Н	34	READYVILLE	319 SW	
J	17	REAGAN	11 SE	
В	37	RED BOILING SPRINGS	320 SE	
K	23	RIVERSIDE	42 NE	
A	22	ROARING SPRING	300 NW	
G	19	ROCKPORT	21 NE	
Н	31	ROCKVALE	70 SE	
Н	45	RODDY	117 SE	
M	14	ROSE CREEK	4 NW	
I	31	ROVER	71 NE	
E	23	RUSKIN	39 NE	
N	23	ST. JOSEPH	43 SE	
I	41	SAMPSON	103 NE	
K	26	SANDY HOOK	58 NW	
K	17	SARDIS	12 NE	
M	18	SAVANNAH	24 NW	
J 	18	SCOTTS HILL	22 SW	
E	28	SCOTTSBORO	308 NW	
N	39	SEQUATCHIE	100 SE	
G	18	SEVENTEEN CREEK	21 NW	

Table 2. Completed geologic coverages in Tennessee, sorted by quadrangle name--Continued

Row	Column	Quadrangle Name	ID	
14	26	CEWANEE	94	NW
M K	36 32	SEWANEE SHELBYVILLE	79 79	NW
E	32 34	SHOP SPRINGS	318	NW
H	3 4 36	SHORT MOUNTAIN	323	SW
L	13	SILERTON	439	SE
F	38	SILVER POINT	326	SW
D	24	SLAYDEN	302	SW
G	2 4 38	SLATDEN SLIGO BRIDGE	302	NW
G	37	SMITHVILLE	327	NE
G	31	SMYRNA	70	NE
M	43	SNOW HILL	112	NE
L	42	SODDY	111	SW
N	38	SOUTH PITTSBURG	100	SW
N	4	SOUTHEAST MEMPHIS	409	SW
G	40	SPARTA	332	NW
I	40	SPENCER	103	NW
G	23	SPOT	40	NE
I	45	SPRING CITY	118	NE
H	28	SPRING HILL	63	SW
п В	28 28	SPRING HILL SPRINGFIELD NORTH	306	SW
C	28 28	SPRINGFIELD NORTH	307	NW
c	20	STANDING ROCK	29	NW
-		STANDING ROCK STANTONVILLE	13	NW
M	16 21		29	SE
D		STEWART		
H	19	SUGAR TREE	21	SE
K I	25	SUMMERTOWN	51 50	NE NW
-	24 56	SUNRISE	163	
E	28	TALBOTT TARPLEY	66	NW
M C	55	TAZEWELL	154	NW NE
K	33 12	TEAGUE	439	NW
I	46	TEN MILE		
_		TEN MILE TENNESSEE CITY	124 39	NW
F G	23 24	TEXAS HOLLOW	49	SE NW
			56	
H	27 25	THETA TRENTON	301	SE NE
A L	23 34	TULLAHOMA	301	SW
	45	TWIN BRIDGES	116	NE
E			324	
B J	38 31	UNION HILL		SW
		UNIONVILLE	71	SE
F H	17 43	VALE VANDEVER	9 109	SE SE
			48	
E	24	VANLEER	48 64	NW
J E	29	VERONA		SE
F	33	VINE	314	SE
G	32	WALTERHILL	315	NW
J	33	WARTRACE	78	SE
F	34	WATERTOWN	318	SW
F	21	WAVERLY	30	SE
L	21	WAYNESBORO	33	SE

Table 2. Completed geologic coverages in Tennessee, sorted by quadrangle name--Continued

Row	Column	Quadrangle Name	ID	
I	33	WEBBS JUNGLE	78	NE
I	39	WELCHLAND	328	NE
D	18	WEST SANDY DIKE	19	SW
В	34	WESTMORELAND	316	SW
M	23	WESTPOINT	43	NE
В	55	WHEELER	153	SE
F	26	WHITE BLUFF	305	SW
D	52	WHITE HOLLOW	145	SW
D	29	WHITES CREEK	307	SE
H	23	WHITFIELD	40	SE
С	38	WHITLEYVILLE	325	NW
M	39	WHITWELL	100	NE
Н	53	WILDWOOD	147	SE
С	37	WILLETTE	321	NE
I	26	WILLIAMSPORT	57	NW
Ď	40	WINDLE	330	SW
M	19	WOLF PIT RIDGE	24	NE
H	35	WOODBURY	319	SE
E	22	WOOLWORTH	39	NW
В	29	YOUNGVILLE	306	SE
Н	17	YUMA	10	SE

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